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with Fe hydroxide or by addition of tannic acid. Other useful separation techniques are solvent extraction and the use of ion-exchange resins.

The fuming process can be performed in reactors such as a plasma flash furnace and a submerged lance furnace. A single-chamber submerged plasma reactor comprising a plasma fired tuyere attached to a plasma torch as heat, gas and momentum source, the tuyere being arranged such that the plasma is generated under the surface of the molten slag phase, constitutes a novel concept in the art of Zn-fuming, and is particularly well suited for implementing the invented process, because of the high energy production coupled to a small quantity of generated gases. This reactor can be equipped with water-cooled peripheral walls, and can be operated in a continuous manner.

The details of the invention are now discussed.
The fuming step consists in the reduction-smelting of the residue, whereby reductants such as natural gas, LPG, coal or cokes, and possibly fluxes such as limestone ($CaCO_3$) dolomite ($MgCO_3$, $CaCO_3$) and silica (SiO_2) are added to produce a fast fuming slag with a high melting point. This high melting point corresponds to limited superheating of the slag. This greatly facilitates freeze-lining, i.e. the formation of a crust on the inner surface of the cooled vessel walls. Limited superheating results in the formation of a relatively stable and thick crust, ensuring good thermal insulation and efficiently protecting the vessel lining from corrosion. Heat losses towards the cooled walls are thus greatly reduced. Moreover, the relatively low silica content of the slag appears to enhance the fuming rate. A slag melting point of at least 1250 °C, and preferably of at least 1300 °C is recommended.

Figure 1 illustrates slag compositions on a ternary CaO-FeO-SiO_2 phase diagram. Representative prior art fayalite slags are shown as areas under references 1, 2 and 3. See "*Phase Equilibria and Thermodynamics of Zinc Fuming Slags*", *E. Jak and P. Hayes, Canadian Metallurgical Quarterly, vol 41, No 2, pp 163 - 174, 2002.* The slag composition according to this invention are shown as areas under reference 4 (for 0 wt% MgO) and references 4 + 5 (for 5 wt.% MgO).

In most cases, the Zn-bearing residue can be fluxed according to the above criteria using limestone and/or dolomite only. Minimising the